Urban water use efficiency

Urban water use efficiency efforts involve technological or behavioral improvements in indoor and outdoor residential, commercial, industrial and institutional water use that lower demand, lower per capita water use, and result in benefits to water supply, water quality, and the environment. In 2000, about 8.7 million acre-feet of water was applied by the urban sector.

Current urban water use efficiency efforts in California

Californians have made great progress toward improved urban water use efficiency. The San Diego County Water Authority reports that their total consumption for 2003 is up less than one percent since 1990 with a population growth of 16 percent. Similarly, the Bay Area Water Agencies Coalition reports that population in their region has increased about 17 percent since 1986 with residential water use increasing by only 3 percent and their total water use actually decreasing by 1 percent. While some other regions of the State cannot claim such progress, these reports indicate that indeed something is working well in the field of water use efficiency. As has been demonstrated in various regions of the state, an increase in population does not necessarily result in a proportionate increase in urban water use.

Credit for this can be given in part to the implementation of water use efficiency practices that have been institutionalized through the California Urban Water Conservation Council's Memorandum of Understanding (MOU). This involves the active participation and united effort of urban water agencies, environmental interests, and the business community. They come together to plan, implement, and track a defined set of urban Best Management Practices (BMPs) including residential indoor and outdoor water use surveys and improvements; commercial, industrial, and institutional water use audits and plumbing retrofits, landscape irrigation audits and upgrades; district water system leak detection and repair programs; metering, washing machine incentive programs, conservation pricing, waste water reduction ordinances, and public information and education programs.

As of Sept. 1, 2003, there were 309 signatories to the Urban MOU, representing 80 percent of all the urban water supplied in California. One example of the results of the CUWCC's member agency implementation efforts is that 2.3 million water efficient toilets have been retrofitted statewide in the past 12 years. The total number of toilets installed before 1992 that still need to be replaced is about 10 million.

Water conservation has become a way of life for Californians, most of whom have easy and affordable access to a wide array of off-the-shelf water efficient plumbing fixtures, washing machines, landscape irrigation systems, and water-thrifty plants at there local home improvement stores, hardware stores, and nurseries.

Potential benefits of urban water use efficiency

The primary benefit of improving water use efficiency is the lowering of demand and the ability to cost-effectively stretch existing water supplies. Once viewed and invoked primarily as a temporary source of water supply in response to drought or emergency water shortage situations, water use efficiency and conservation approaches have become a viable long-term supply option, saving considerable capital and operating costs for utilities and consumers, avoiding environmental degradation, and creating multiple benefits for all sectors.

The financial benefits to agencies of water use efficiency are the avoided costs of new supply construction and the avoided costs of water supply treatment and wastewater treatment plant permitting, construction and operation. Energy costs, which are often much greater than water costs, are avoided as well, both by the agency and the customer.

The multiple benefits of urban water use efficiency include the positive impacts on water quality and water quantity in watercourses by allowing more flows to remain in the environment. The timing of such additional flow is often critical to maintenance of endangered habitats. Water Use Efficiency can also reduce peak demand, green waste production, and urban dry weather runoff.

The range of net water savings of existing urban water use efficiency efforts by 2030 has been estimated to be 1.085 million to 1.335 million acre-feet per year (CALFED Record of Decision, 2000) with a cost of $110 to $1,100 per acre-foot. A recent state-sponsored study (Pacific Institute's "Waste Not, Want Not") indicates potential savings of 2 to 2.3 million acre-feet per year.

Potential costs of urban water use efficiency

Overall, urban water use efficiency can be a very cost-effective strategy for new water supply. The cost of most of these measures ranges from ($29 to $700 per acre-foot, checking), depending upon the program (per CUWCC). These costs include not only the full cost to manage water conservation programs, but also any capital investments and staffing that may be required. In fact, water conservation measures that also include reductions in energy costs can produce a negative cost when those benefits to the agency and customer exceed the costs. Water use efficiency programs can be cost-beneficial when implementation and management costs are less than the cost of implementing and managing the next increment of supply augmentation. However, where the cost of water supply is lower, it should be analyzed to find the overall statewide benefit if the conservation program is undertaken.

Major issues facing additional urban water use efficiency

The major issues related to improving urban water use efficiency in California are related to funding, program implementation, data collection, education and motivation, innovation, and dry year considerations.

1. Funding - More funding is needed for water use efficiency implementation projects and data gathering and analysis. Funds dedicated to Water Use Efficiency have fallen below commitments made in 2000 through the CALFED Record of Decision that called for a state and federal investment of $1.5 billion to $2 billion during Stage One from 2000-2007. State and federal agencies committed to funding 50 percent (25 percent each) with local agencies funding the remaining 50 percent of water use efficiency activities.

ROD Expenditure Projections, including State, federal and local shares and Actual State and Federal Expenditures to Date (in $ millions)

Year	2001	2002	2003	2004	2005	2006	2007	Total
ROD Proj.	31	62	299	641	641	641	641	2,956
Actual Expend.	44	58	64	?	?	?	?	?

Presently, through the CUWCC MOU, local agencies have committed to funding locally cost effective BMPs. State and federal programs, on an erratic basis, provide a source of funding for the BMPs beyond the MOU level, for actions other than standard BMPs, and for those BMPs that may not be locally cost effective. Developing a consistent and broadly acceptable method to evaluate cost-effectiveness and water savings can be problematic.

While the initiatives have provided state bond funding for water use efficiency projects through Propositions 13 and 50, retaining sufficient state and federal expertise to administer the programs and provide financial and technical assistance in this field is not easy with budget and staff cutbacks. Local agencies also face increasing challenges to implement water use efficiency actions with limited staff and budgets.

Grant programs often miss the opportunity to fund worthwhile projects in small and disadvantaged communities. It is often difficult for them to compete for limited grant funds, although their needs are often great. Also, investor-owned utilities have been ineligible for state funding for most programs.

2. Program implementation - Even with the effective on-going efforts, much more can be done and needs to be done to implement effective water conservation programs. An expanding population, climatic uncertainties, and legal and economic conditions likely will increase the pressure to improve the efficiency of water use in California. Whereas, in the past, water conservation was seen as a short term response to drought conditions, present and future water use efficiency activities are now viewed as long term investments that, combined with other water management actions, make a significant contribution toward a sustainable water future for California.

The CUWCC Best Management Practices have provided an effective way for agencies to identify and implement locally cost effective urban water conservation programs. But

not all water suppliers have signed on to the agreement and not all of the signatories are fully implementing those practices. Further, while the council is considering more BMPs, there now are and in the future will be other activities could contribute toward improved water use efficiency including new methods and technologies that can be expected to significantly increase conservation potential.

3. Data collection - Documentation and evaluation of the achievements attributable to water use efficiency projects and programs, vital elements of successful water use efficiency efforts, need to be improved. The quantification of benefits for many projects lacks the necessary level of scientific rigor. The basis for making such determinations and managing water efficiently is accurate water measurement, coupled with volumetric billing, complemented by ongoing accounting, monitoring and assessment practices.

The measurement of water use and associated information provided to the water user are essential to efficient water management. Documenting water savings related to the various programs rests on the ability to track water use. Most urban areas are metered, but several metropolitan areas, mostly in the Central Valley and Foothill regions, remain unmetered. About 700,000 water users remain unmetered.

Easily retrievable, standardized and comprehensive baseline data about California urban water use are not available. Present information sources include annual Public Water System Survey (PWSS) reports to DWR, annual CUWCC BMP Reports submitted by MOU signatories only, and Urban Water Management Plans that are updated every five years. Efforts are ongoing to standardize units of measurement for water use categories. Both of these endeavors are necessary to gain an accurate understanding of the full cost, value, impact and direction of urban water use efficiency strategies.

More information is needed about how Californians use water to help determine how scarce resources should be invested to maximize water savings and other benefits. How many acres of irrigated landscape? What is the breakdown between indoor and outdoor water use, between single-family and multifamily residences?

4. Education and motivation - Likewise, there is a need for information related to why Californians adopted water use efficiency practices and how those practices could be encouraged and sustained. Also, we are not sure what types of incentives customers or water districts respond best to, while we have seen evidence of a strong response to financial incentives whenever offered in a simple, understandable format and process. Which technological changes should be pursued for short-term situations (during water shortages) compared to long-term, and which behavioral changes are most effective short and long term?

5. Innovation - A more rapid response to new technologies and ideas should be pursued. Emerging water conservation technologies and techniques offer new opportunities to save water, but often field-testing and evaluations are needed before being promoted and adopted full scale. Presently it takes too long to run pilot projects,

conduct research, and provide the sound scientific data needed by agencies and consumers to adopt new behaviors or purchase new equipment.

6. Dry-year considerations - Measures can and need to be taken now to prepare for dry years. As evidenced by the recent energy crisis in 2000, Californians respond admirably to calls for conservation during times of shortages. Under extraordinary circumstances, such as droughts, citizens are called upon to make changes in their normal water use patterns for a given period of time.

Water use efficiency can help stretch dry-year supplies. By exercising water use efficiency practices during wetter years, more water can be stored in groundwater basins and surface water reservoirs for drier years, thus raising the threshold for needing extraordinary conservation efforts in dry times.

Sidebar: demand hardening

Most water use efficiency programs rely on plumbing and appliance retrofits and changes in the consumer's water use that can take place on a consistent, predictable basis. Once most of these retrofits have been completed, some worry that their ability to further reduce water use during dry years will be limited. This phenomenon is known as 'demand hardening'. Districts and customers that have participated actively in water conservation programs fear that across-the-board cuts will affect them disproportionately. However, consumers will still respond behaviorally in drought times, and this additional water savings from the drought response can be measured. Public education has proven effective in rallying support for short-term additional water conservation measures.

Recommendations to achieve additional urban water use efficiency

The following actions reflect some of the possible solutions to the issues raised in the previous section. A wide range of strategies will need to be employed to accomplish the actions including financial incentives; revisions in state and local codes and standards; and legislative initiatives. Most of these will be cooperative efforts, involving state, federal, and local agencies and stakeholders and California citizens.

1. Fund water use efficiency projects

1. Secure $XX of funding to support incentive programs, both implementation and data quantification, and associated expertise at the local level and at the state and federal levels.
2. Identify and establish priorities for future grant programs and other incentives.
3. Provide ample opportunities for small districts, economically disadvantaged communities, and investor owned utilities to benefit from WUE incentive programs.
4. Work with tribes and community-based organizations to get the word out and help in the development of proposals.
5. Honor environmental justice policies established by funding agencies and others.

2. Expand implementation efforts

General

1. Work with CUWCC and others to encourage and help local agencies and governments in fully developing, implementing and sustaining water conservation programs.
2. Develop and implement rate structures that encourage water use efficiency.
3. Conduct distribution system audits, leak detection and repair on a regular basis to achieve less than xx percent losses, focusing first on the top ten percent of leaks.
4. Help water customers perform leak detection and repair on a regular basis.
5. Employ recycled water whenever feasible for landscape, industrial, and other approved uses.
6. Encourage the plumbing of new construction for the use of non-potable water.

Urban landscape implementation efforts

7. Create "California Friendly Landscapes," those that attain maximum water use efficiency by applying the minimum amount of water necessary to sustain them. Irrigate landscapes efficiently through landscape design, installation, management and maintenance practices including plant selection, irrigation scheduling, landscape audits, dedicated irrigation meters, weather driven timers, etc.
8. Employ graywater systems where conditions permit.
9. Employ cistern systems to capture storm water where appropriate.

Residential implementation efforts

10. Work with builders, manufacturers and others to establish a "Water Star Homes" program for new and existing homes and performance standards for fixtures and appliances, reducing residential water use.
11. Retrofit remaining standard toilets with more efficient models, such as dual-flush toilets or 1.0 gallon-per-flush toilets.
12. Replace standard clothes washers with high efficiency models.
13. Employ hot water on demand systems in new residential construction.

Commercial, industrial, and institutional implementation efforts

14. Pursue best available technology and management practices in the commercial, industrial, and institutional sector.
15. Retrofit standard urinals with more efficient models.
16. Conduct audits and provide incentives for retrofits.
17. Encourage the formation of employee/management "Green Teams" in commercial, industrial and institutional customers to promote sustainable resource use.
18. Encourage dry cooling for power plants.

Communication efforts

19. Provide comprehensive public information, education, training, and technical assistance programs to foster a strong environmental resource ethic with an emphasis on water use efficiency.

20. Coordinate with other resource management programs such as watershed management, urban runoff management, waste water treatment, and green waste reduction.

3. Gather required data: Plan, research and monitor performance

1. Meter remaining urban customers and bill by volume of use, submeter new multifamily residential construction, and submeter large landscape irrigation.
2. Employ scientific methods to research, monitor, and evaluate existing and new water use efficiency technologies and management practices, including the positive and potentially negative effects of these practices and real world challenges to implementation.
3. Increase the emphasis on the science aspect of projects, especially monitoring and evaluation, in support of CALFED goals.
4. Work with state and federal grant recipients and others to obtain more useful and consistent data from funded projects and other activities, including the documentation of the sources of data and the methods of data collection.
5. Encourage comprehensive planning and implementation of water conservation activities at the local and regional level. Pursue and promote state or local policies, guidelines, ordinances, or regulations to affect positive change.
6. Encourage more signatories to the CUWCC Memorandum of Understanding and full participation by present signatories.
7. With the leadership of the CUWCC and participation of other stakeholders, standardize utility billing and reporting systems by customer type and units of measure and identify industrial water use customers by North American Industry Classification System (NAICS). Collect end-use data periodically. Coordination of water use reports and the use of a web-based format for reporting could also improve data collection and exchange. Amend the Urban Water Management Planning Act to require uniform water use reporting.
8. Gain more information through surveys and other methods to better understand how Californians use water and how to persuade them to adopt more efficient practices and behaviors. Establish a goal for per capita water use in California.

4. Educate and motivate

1. Develop community based social marketing surveys and strategies for conservation activities to foster water use efficiency, with the participation of the water industry, environmental interests, and the business communities.
2. Identify and overcome barriers, communicate the benefits, provide incentives, and gain commitment from all involved.

5. Innovate

1. Explore and identify innovative technologies and techniques to improve water use efficiency and develop new BMPs to correspond with new information.

2. Fast track pilot projects, demonstrations, and model programs exploring state-of-the-art, water-saving technologies and procedures and publicize results widely.

6. Prepare for dry years

1. Have a comprehensive campaign ready to go for the next drought.
2. Conduct contingency planning for extraordinary short- and long-term shortages.
3. Determine a “drought per capita” potential.